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Catch of the Decade: Changes in U.S. Seafood Consumption and MeHg Intake over Time

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Exposure to methylmercury (MeHg) in fish is of grave concern to women of reproductive age because of the adverse health effects this toxicant can have on developing fetuses. MeHg also is linked to neurological and cardiovascular disease in adults.[1] When inorganic mercury enters waterways, microorganisms convert it to toxic MeHg, which accumulates in the food that fish and humans eat.[2] Mitigating mercury pollution, therefore, has become a high priority for organizations such as the United Nations Environment Programme.[3] In a study published in *Environmental Health Perspectives*, Elsie Sunderland and colleagues at Harvard University estimated changes in Americans' seafood-related MeHg exposures over the past decade, with an eye toward informing strategies to reduce mercury pollution.[4]

Sunderland says the new analysis can be used to assess how the Minamata Convention on Mercury, which took effect 16 August 2017, may affect seafood consumers. "We need to understand very thoroughly the geographic origins of fish that people eat, and what will happen in the next ten years in response to [the implementation of] the Minamata Convention," she says.

The Minamata Convention is a global treaty to decrease mercury emissions.[5] Its name refers to the city of Minamata, Japan, where MeHg pollution in the 1950s poisoned thousands of people and caused severe neurological damage in babies exposed prenatally.[6] Parties to the Minamata Convention prohibit mercury mines, reduce or eliminate the use of mercury in artisanal and small-scale gold mining, implement air-pollution controls on mercury emitters, and phase out mercury in items such as batteries, cosmetics, light bulbs, and dental fillings. On 26 February 2018, Belgium became the 89th party to the convention.[7]

For the new study, the authors used data[8] from the National Marine Fisheries Service to estimate the quantity and sources of seafood eaten in the United States between 2010 and 2012. They used previously published data[9] on mercury concentrations in fish to estimate the annual per-capita intake of MeHg among the U.S. population. Then, they compared these estimates with similar estimates[10] for the years 2000–2002 to investigate how MeHg exposures and sources of seafood had changed over time.

Based on their analysis, the authors estimated that between 2010 and 2012, seafood was responsible for 82% of the MeHg

Between 2000–2002 and 2010–2012, people shifted from eating mostly canned tuna to more fresh and frozen fillets. This shift may have increased the overall intake of MeHg because the tuna varieties used for fillets often have higher MeHg levels than the tuna commonly used in canned tuna. Image: © Chubykin Arkady/Shutterstock

intake in the United States, with 45% of U.S. intake coming from open-ocean fish and 37% from coastal species. Seafood caught in the Pacific Ocean was estimated to account for more than half the MeHg intake in those years, in comparison with only 12% coming from seafood caught in the North Atlantic Ocean. They further estimated that in 2010–2012, canned and fresh tuna, most of which came from the open ocean, contributed the highest fraction (38%) of estimated MeHg intake. In contrast, shrimp provided about 10%, farmed fish and freshwater catches each supplied 9%, and three other categories—pollock, flatfishes (sole, flounder, and halibut), and freshwater catfish—each contributed 5%. Fresh and canned salmon contributed only 4% of all MeHg intake.

The authors' findings suggest that shrimp and tuna (fresh and canned) were the most popular seafood choices in 2010–2012 and combined made up nearly 40% of seafood meals eaten. A decade earlier, in 2000–2002, fresh and canned tuna were the most popular choices.[10] Fresh and frozen tuna made up 29% of the overall tuna supply in 2010–2012, up from 10% in 2000–2002, and canned light tuna made up 56% of the supply, down from 76% in 2000–2002.

The authors note that tuna varieties used for fresh and frozen fillets often have higher MeHg levels than varieties commonly used in canned tuna have. They propose that this shift in consumption contributed to an increase in the estimated tuna-related intake of MeHg in 2010–2012. In addition, the rising popularity of sashimi and sushi, which use large tuna, sea bass, and yellowtail, was estimated to have slightly increased the total per capita MeHg exposure by 0.04 μg per person per day. "Even if you eat a small amount [of] tuna sushi or sashimi, you could ingest much more methylmercury than if you eat a big pile of shrimp," says Sunderland.

Shrimp consumption had the largest increase between the two time periods. People appear to have shifted toward eating more farmed shrimp than wild harvests, a trend that is estimated to have lowered the overall contribution of shrimp to MeHg intake. The authors speculate that consumers may be substituting shrimp for canned light tuna.

Reducing MeHg levels in fish remains important for women of childbearing age and for children. However, Sunderland stresses that fish is a valuable source of protein and a very nutritious food packed with omega-3 fatty acids and essential micronutrients, including vitamin D, iodine, and selenium. People should not shun fish "in favor of a hamburger or highly processed foods that are much less healthy for you," Sunderland says. She recommends eating shrimp, sardines, herring, salmon, and shellfish, such as scallops and crabs, which are low in MeHg and high in omega-3 fatty acids.

The study highlights that substantial amounts of MeHg came from catches outside U.S. waters and much of it from imports, notes William Cheung, director of science at the NF-UBC Nereus Program at the University of British Columbia. "In today's globalized seafood market and supply chain, mercury intake through seafood is not only a domestic issue but a global problem that needs international collaboration and effort," Cheung says. "This stresses the importance of the Minamata Convention and its implementation to reduce mercury emissions and contamination in the oceans."

Carol Potera, based in Montana, also writes for *Microbe*, *Genetic Engineering News*, and the *American Journal of Nursing*.

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